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ABSTRACT

As a follow-up to an original study reported by Hershberger (1963), the present study assessed the instructional effectiveness of typographical cueing in both conventional and programed texts as a function of reading ability, reading instructions, and cueing complexity. A total of 118 eighth graders were divided into eight groups. Each group read a lesson on the history of Texas and was tested a week before the lesson and again the day after the lesson. Each group read a different form of the lesson with four groups reading programed versions and four reading conventional, non-quizzed versions. From each of these sets of four, one group read lesson booklets incorporating complex typographical cueing, another read booklets incorporating simple typographical cueing, and a third group (control) read booklets without typographical cueing. The fourth group from each set read lesson booklets incorporating complex typographical cueing, but, unlike the other cued books, these did not include a detailed explanation of the purpose or use of typographical cueing. The major findings were: the programed, or quizzed, versions of the text were more effective; self-evaluational test items facilitated the learning of essential core content; and the effects of typographical cueing and self-evaluating quizzing are independent and additive. (WR)

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Wayne A. Hershberger
Donald F. Terry

December 1963

Office of Naval Research
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COMPLEXITY OF TYPOGRAPHICAL CUEING
IN PROGRAMED AND CONVENTIONAL TEXTS.

The purpose of the present study was to examine further the findings of a previous study reported by Hershberger, 1963b. In this previous study, hereafter referred to as the original study, it was found that a complex form of typographical cueing distinguishing four types of essential lesson content and one type of enrichment content did not increase the instructional effectiveness of discursively written texts for either high or low ability fifth-grade readers. On the other hand, adding self-evaluational test items to the lessons significantly increased learning for both the cued and non-cued versions of the texts.

In view of the common practice among mature readers of underlining important passages of text for emphasis, it is somewhat surprising that typographical cueing, which presumably serves a similar function, was found to be ineffective. Perhaps the reported failure of typographical cueing to improve learning is attributable to certain methodological peculiarities of the original experiment rather than to an inherent worthlessness of the cueing technique. The present study was conducted to evaluate three such hypotheses, all of which stem from a common thesis, namely that the complex typographical cueing scheme used in the original study was too demanding of the subjects. There is support for this thesis in the finding of Klare, Mabre and Gustafson (1954), that the effectiveness of underlining (a particular form of typographical cueing) depends in part upon the ability of the reader. Klare et al. found that whereas the underlining of important words in a training manual on reciprocating engines hindered airmen of low mechanical aptitude, it assisted airmen of high mechanical aptitude.

The three specific hypotheses tested in the present study were:

1) Complex typographical cueing, distinguishing five categories of lesson content, demands the flexibility of reading style characteristic of only the able reader. (The fifth-grade students used in the original study may not yet have developed

the necessary flexibility of reading style.) Specifically, the present study tests the hypothesis that eighth-grade students, with their increased reading ability, will benefit from the same typographical cueing which proved ineffective with the fifth-grade students.

2) Detailed reading instructions are necessary if even the able reader is to properly utilize complex typographical cueing. (No such instructions were used in the original study.) Specifically, the present study tests the hypothesis that, of two groups of eighth-grade students reading a lesson booklet incorporating complex typographical cueing (distinguishing five categories of lesson content), that group which is given a detailed explanation of the purpose and proper use of the heterogeneous typography will perform better than the other group which is not given such an explanation.

3) A simple cueing scheme distinguishing two categories of lesson content will be more effective than: a) no cueing, or b) a complex cueing scheme distinguishing five content categories, the latter having the deleterious effect of overwhelming even the able and well instructed reader. The complex cueing scheme used both here and in the original study distinguished four types of essential content and one type of enrichment content. In contrast, the simple cueing scheme used in the present experiment merely distinguished the essential from the enrichment content of the lesson.

The effects of reading ability, reading instructions, and cueing complexity were assessed here using both conventional and programed texts. The latter incorporated self-evaluational test items allowing the reader to assess periodically his knowledge of the core, or essential content of the lesson and to remedy deficiencies.

Method

Subjects

A total of 126 eighth-grade students from five different classrooms in two Menlo Park Elementary Schools participated in the study.

Results are reported for a total of 118 students for whom complete test data were obtained. The mean Reading Grade Placement score (California Achievement Test) for this group of 118 Ss was 9.39 years with a standard deviation of 1.48.[1]

Ignoring classroom affiliation, Ss were systematically divided, on the basis of their R. G. P. scores, into 8 experimental groups, of equivalent size, having comparable mean R. G. P. scores. The R. G. P. score means for these 8 groups ranged from 9.22 to 9.53 years.

The eight groups are listed and coded in Table 2 of the Results section in terms of the type of experimental materials administered to each group. The various materials are described in detail below.

Materials

The Lesson. A discursively written lesson (i.e., incorporating both core and enrichment content) on the history of Texas was excerpted from New Ways in the New World (Todd and Cooper, 1956), an eighth-grade, California, state-approved text. This lesson, of approximately 2,000 words, was one of the two lessons used in the original study. Six different printed versions of the lesson were prepared by using 3 typographical formats in each of two types of text.

Type of Text. The lesson was prepared in two parallel versions of text: a) as a conventional text, C, and b) as a programed text, P, containing quiz-sheets (approximately 1 per 1 1/2 pages of text) which required the reader to evaluate periodically his learning of the essential, core content of the lesson, and allowed him to rectify deficiencies. Each quiz-sheet contained several (approximately 7 on the average) multiple-choice questions or incomplete sentences which S was instructed to answer correctly. If S did not know the answer he was instructed to

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[1] These R. G. P. scores were one year old at the time of the experiment; hence, the figures given above underestimate the Ss' actual reading potential by approximately one year. R. G. P. scores were unavailable for twenty Ss. In these cases, teacher estimates of the Ss' R. G. P. scores were employed.

turn back and reread the pertinent material until he found the correct answer. These self-test items covered only the essential, or core content of the lesson; there were no such items on the enrichment content of the lesson.

Typographical Format. The lesson content was divided into five categories, each differing in level of importance or difficulty. Four of the categories comprised the core, or essential content of the lesson. The fifth type of content, which comprised about two-thirds of the lesson, was enrichment material.

Each version of text -- programed, and conventional -- was prepared in three parallel typographical formats: 5C, 2C, and 1C. The three formats differed only in the number of lesson content categories distinguished through the use of heterogeneous typography. Underlining, variation in size of type, and variation in color of ink were used in Format 5C (C = categories) to distinguish all five categories of lesson content. Variation in color of ink was used in Format 2C to distinguish the essential from the enrichment content. Homogeneous typography was used in Format 1C, a control format, to group all content categories into one.

Table 1 briefly describes the five lesson content categories and shows for each category the style of typography used in each of the three typographical formats.

Reading Instructions. Eight different sets of reading instructions were prepared. An example of each set can be found in the Appendix. Four of these eight sets included a common subset of instructions explaining the proper use of self-evaluational test items and were used with the programed versions of the lesson. The remaining four sets of instructions were used with conventional, non-quizzed versions of the lesson. Out of each of these two groups of four sets each, two sets of instruction explained both the purpose and the proper use of typographical cueing. One of these sets was written for and used with the 2C typographical format. The other was written for and used with the 5C typographical format. The remaining two sets in each group of four did not explain typographical cueing. One set was used with the 1C

Table 1

Cueing Schemes

Content Category	Typographical Formats		
	5C	2C	1C
Core Content:			
New and unfamiliar key words	Full caps, red	Lower case, red	Lower case, black
Familiar key words, key statements, dates, etc.	Lower case, red with red underlining	Lower case, red	Lower case, black
Basic core statements	Lower case, red	Lower case, red	Lower case, black
Key examples and rephrasing of key statements	Lower case, black with red underlining	Lower case, red	Lower case, black
Support Content:			
Nonessential statements, examples, interesting sidelights, etc.	Lower case, black	Lower case, black	Lower case, black

typographical format and the other with the 5C typographical format. Hence, in all, there were 8 different forms of the lesson booklet, one for each type of reading instruction.

Test. The objective, multiple-choice and incomplete-sentence type test used here was described in the report of the original study. The test was designed so that each independent and unitary bit of information tested and correctly answered was given a score of one. The test was not scored for spelling.

Eleven of the multiple-choice items of the test covered the enrichment content of the lesson. Typical items of this type were: "A Mexican army attacked the Alamo at: (Check the best answer) a) dawn, b) noon, c) dusk, d) midnight;" and: "Which of the following languages were spoken by people working on the boat landings at Natchitoches in 1821? (Check the best answer) a) Spanish, b) English, c) French, d) all of these."

Thirty-three test items covered the essential, or core content of the lesson. Typical items of this type were: "Texas won its independence in the year _____;" and: "Who was the first President of Texas? _____ _____."

Procedure

Six of the eight groups of Ss described above read a different version of the lesson. Three groups read programed versions and three read conventional versions. For each of these sets of three, one group read the 5C typographicl format, another the 2C format, and a third the 1C format. Each of these six types of lesson booklets was prefaced by a corresponding set of reading instructions which explained in detail the proper use of any self-test items or typographical cueing appearing in the booklet itself.

The remaining two experimental groups read the lesson in the 5C format, one reading the programed and the other the conventional version of text. However, the reading instructions used with these two lesson booklets were the same as those used in the original study and did not explain either the purpose or the proper use of the complex typographical cueing.

Each S was tested twice, once before (pretest) and once after (posttest) reading the lesson. The pretest was administered one week (7 days) before the lesson reading session. The posttest was administered the day following the lesson. The same test instrument was used in both testing sessions.

The experiment was conducted concurrentl/ in all five classrooms. In order to minimize, if not avoid, undesirable novelty or Hawthorne

effects, the regular classroom teachers were used as experimental administrators. The teachers were briefed ahead of time and each was given a detailed set of instructions. In addition to stating administrative details, these instructions admonished the teachers: (a) not to coach the students on the lesson topics during or between experimental sessions, (b) not to advise the students that they were participating in an experiment, and (c) not to urge the students to excel. The teachers were instructed to be matter-of-fact about each experimental session as though it were an integral part of the school day.

At the beginning of each experimental session (i.e., the pretest, learning, and posttest sessions) the teachers assigned regular school work to be performed by Ss who completed the experimental task early. There was no time limit on either the lessons or the tests, but the teachers collected the materials as soon as each S finished. Also, teachers were instructed to record the time it took each S to complete his lesson.

Results

A core gain score was obtained for each S by subtracting his score on the core items of the pretest from his score on the core items of the posttest. An enrichment gain score was computed for each S by subtracting his score on the enrichment items of the pretest from his corresponding score on the posttest.

Table 2 shows the mean core gain scores, the mean enrichment gain scores, and the mean lesson reading times for each of the 8 experimental groups. As the result of an administrative oversight, lesson reading times were obtained for only a portion of the Ss in each experimental group. The actual number of observations included in the calculations of mean reading times for each group is noted in Table 2. Figure 1 shows the total (core + enrichment) gain score means for each experimental group plotted against mean reading time.

Table 2

Mean Gain Scores and Reading Times

for Each Experimental Group

Group	Code	N	Mean Gain Scores		Reading Times (Min.)	
			Core	Enrichment	Mean	N[a]
Programed Text						
Format 1C	P-1C	15	23.87	3.47	29.00	7
Format 2C	P-2C	16	26.06	1.56	24.57	7
Format 5C	P-5C	15	18.87	2.47	24.22	9
Format 5C-X[b]	P-5C-X	15	20.47	2.47	24.71	7
Conventional Text						
Format 1C	C-1C	13	15.62	3.69	14.80	10
Format 2C	C-2C	16	16.56	2.13	13.58	12
Format 5C	C-5C	15	15.67	3.20	16.55	11
Format 5C-X[b]	C-5C-X	13	15.46	3.31	15.56	9

[a] As a result of an administrative oversight reading times were recorded for some Ss in each group. This column shows the number of Ss in each group for whom reading or study times were recorded.

[b] These lesson booklets were prefaced by the reading instructions of the type used in the original study. These instructions did not explain either the purpose or the proper use of the heterogeneous typography.

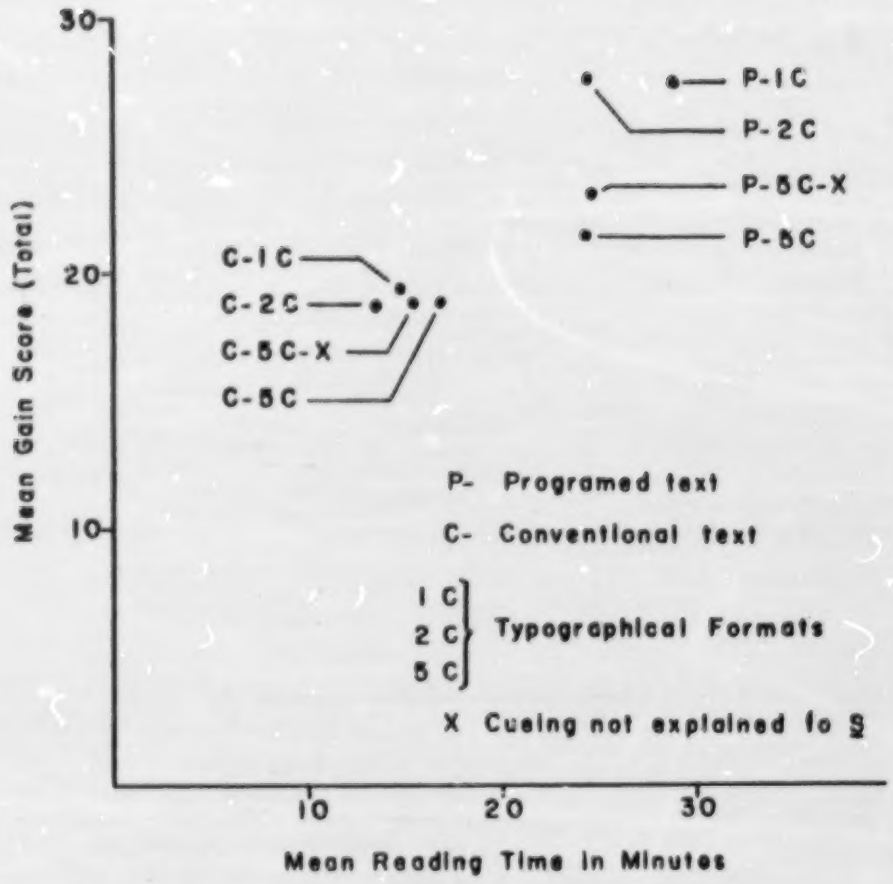

Fig. 1. Total gain score means for the eight experimental groups plotted against mean reading times.

Hypothesis I: Concerning the Ability of the Reader

It was hypothesized that the Ss of the present study (eighth-grade students), being more able readers than the fifth-grade students used in the original study, would benefit from the complex typographical cueing which had proved ineffective in the original study.

Two experimental groups in the present study read lesson booklets of the type used in the original study. One group read a programed version and the other a conventional or non-quizzed version. Both versions incorporated the 5C typographical format, and the reading instructions of neither version explained the purpose or the proper use of the heterogeneous typography. These two groups are identified in Table 2 as: P-5C-X, and C-5C-X. The gain scores for these two groups were compared with the corresponding gain scores for the two control groups: P-1C, and C-1C. Table 3 summarizes a three-way (Typographical Format x Type of Text x Content, core vs. enrichment) analysis of variance (Lindquist, 1953) of the gain scores for these four groups.

The hypothesis is not supported. No effect involving typographical format is significant. The other two main effects, Text and Content, and their interaction T x C are significant, $p < .005$. The means yielding these significant effects are shown in Table 4. The gain scores are greater for the core content than the enrichment content. The programed version of the text is more effective than the conventional version. And, the self-evaluational test items in the programed version of the lesson increase the core gain scores, while they have a negligible effect upon the learning of the enrichment content.

Hypothesis II: Concerning Reading Instructions

It was hypothesized that, of the Ss reading the lesson booklets incorporating complex typographical cueing, those Ss given a detailed explanation of the purpose and proper use of the heterogeneous typography (groups P-5C and C-5C) would learn more than those Ss not given such an explanation (groups P-5C-X and C-5C-X). Table 5 summarizes a three-way (Instructions x Type of Text x Content, core vs. enrichment) analysis of variance of the gain scores for these four experimental groups.

Table 3

Statistical Analysis of Hypothesis I: Three-Way (Format x Text x Content) Analysis of Variance of Gain Scores for Groups P-5C-X, C-5C-X, P-1C, and C-1C

Source	df	MS	F
Between Ss	55		
Format	1	47.58	1.68
Text	1	258.71	9.11*
F x T	1	31.08	1.09
Error (between Ss)	52	28.40	
Within Ss	56		
Content	1	7056.44	452.34**
C x F	1	9.72	
C x T	1	617.58	39.59**
C x F x T	1	13.58	
Error (within Ss)	52	15.60	

* $P \leq .005$

** $P \leq .001$

Table 4

Gain Score Means Yielding Significant Effects in ANOVA Summarized in Table 3

	Content		
Text	Core	Enrichment	Total
Programed	22.17	2.97	25.14
Conventional	15.54	3.50	19.04
Combined	19.09	3.21	

Table 5

Statistical Analysis of Hypothesis II:
Three-Way (Instructions x Text x Content)
Analysis of Variance of Gain Scores for
Groups P-5C, C-5C, P-5C-X, and C-5C-X

Source	df	MS	F
Between Ss	57		
Instructions	1	5.87	
Text	1	79.43	2.82
I x T	1	4.16	
Error (between Ss)	54	28.15	
Within Ss	58		
Content	1	6390.70	287.48**
C x I	1	0.22	
C x T	1	252.08	11.34*
C x I x T	1	24.22	1.09
Error (within Ss)	54	22.23	

* $p \leq .005$
** $p \leq .001$

The hypothesis is not supported. No effect involving Instructions is significant. One main effect, Content ($p \leq .001$) and one interaction, Content by Text ($p \leq .005$), are significant. The means yielding these two significant effects are shown in Table 6. The gain scores are greater for the core content than the enrichment content; and, the self-evaluational responding in the programed version of the lesson increases the core gain scores, while it has negligible effect upon the enrichment gain scores.

Table 6

Gain Score Means Yielding Significant Effects in ANOVA Summarized in Table 5

	Content	
Text	Core	Enrichment
Programed	19.67	2.47
Conventional	15.57	3.25
Combined	17.69	2.84

Hypothesis III: Concerning Cueing Complexity

It was hypothesized that a simple cueing scheme distinguishing two categories of lesson content would be more effective than a) no cueing, or b) a complex cueing scheme distinguishing five content categories. All eight experimental groups were used in the test of this hypothesis. Since the presence or absence of detailed reading instructions has no effect upon the instructional effectiveness of the 5C Typographical Format (i.e., Hypothesis II was rejected), groups P-5C-X and C-5C-X were combined with groups P-5C and C-5C respectively. The gain scores for the resulting 6 experimental groups were compared by analysis of variance. Table 7 summarizes a three-way (Typographical Format x Type of Text x Content, core vs. enrichment) analysis of variance of the gain scores for the 6 groups. Two main effects (Text, and Content) and two interactions (Text by Content, and Format by Content) are statistically significant, $p \leq .01$. The means yielding the first three effects are shown in Table 8. The core gain scores are greater than the enrichment gain scores; the programed text is superior to the conventional text; and, the self-evaluational test items of the programed text increase the core gain scores but have a negligible effect upon the enrichment gain scores.

Table 7

Statistical Analysis of Hypothesis III:
Three-Way (Format x Text x Content)
Analysis of Variance of Gain Scores
for All Eight Experimental Groups

Source	df	MS	F
Between Ss	117		
Format	2	59.90	2.08
Text	1	522.94	18.14**
F x T	2	50.15	1.74
Error (between Ss)	112	28.83	
Within Ss	118		
Content	1	16,029.77	701.21**
C x F	2	110.24	4.82*
C x T	1	737.90	32.28**
C x F x T	2	44.84	1.96
Error (within Ss)	112	22.86	

Note. -- For this analysis, groups P-5C-X and C-5C-X were combined with groups P-5C, and C-5C respectively.

*$P \leq .01$

**$P \leq .001$

Table 8

Gain Score Means Yielding Three Significant Effects in ANOVA Summarized in Table 8: Text, Content, and Content x Text

	Content		
Text	Core	Enrichment	Total
Programed Text	22.38	2.48	24.86
Conventional Text	15.86	3.04	18.90
Combined	19.23	2.75	

The significant Format x Content interaction constitutes limited support for the hypothesis. The means yielding the Format x Content effect are plotted in Figure 2.

The interaction is such that, in comparison to both Formats 1C and 5C, Format 2C, which incorporates a simple form of typographical cueing, increases learning of the core content but inhibits learning of the enrichment content.

Analysis of Reading Time

The mean reading times for the eight experimental groups are shown in Table 2 and plotted in Figure 1. Combining groups P-5C-X and C-5C-X with P-5C and C-5C, respectively, the reading time data for the resultant 6 groups were examined for significant differences in a three-way (Format x Text x Content) analysis of variance. Only one effect is significant: the programed text takes significantly longer to read than the non-quizzed conventional text, $F = 57.16$, $df = 1/69$, $p \leq .001$.

Learning Scores and Error Rates

The quiz-sheets in the four programed versions of the lesson (P-1C, P-2C, P-5C, and P-5C-X) were scored for errors and the results analyzed. A simple analysis of variance yielded no significant differences between the four groups.

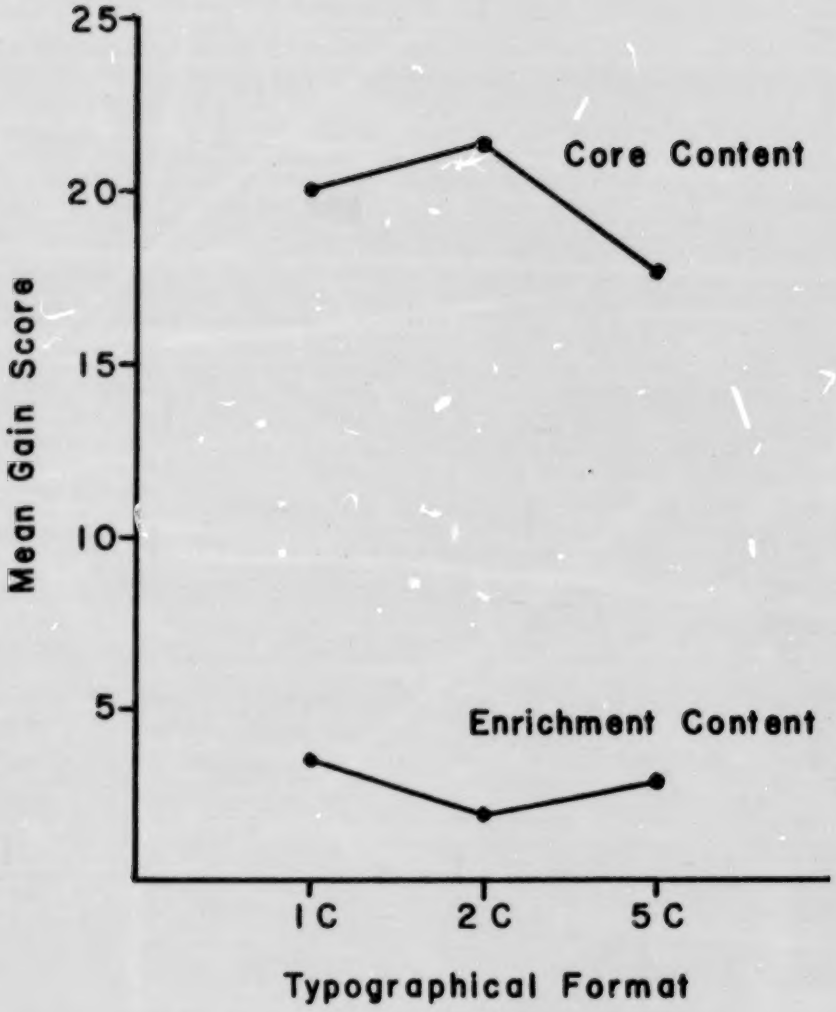

Fig. 2. Mean gain scores for all Ss as a function of typographical format and type of lesson content tested. (Format 5C includes 5C-X.)

Combining all four versions of the programed text, the error rate for the lesson was determined by dividing the mean number of errors per S by the total number of errors possible per S. This error rate was found to be .10.

In the original study using fifth-grade Ss, and in another study using sixth-grade Ss (Hershberger, 1963a) the error rates for the lesson used in the present study were found to be .12 and .10 respectively.

Discussion

Eighth-grade students, like their less able fifth-grade juniors (Hershberger, 1963b), do not benefit from complex typographical cueing -- distinguishing five different categories of lesson content varying in importance or difficulty -- either with or without the "assistance" of detailed reading instructions.

However, when only two content categories are distinguished -- the essential, core content from the enrichment content -- with the eighth-grade student instructed to read everything and learn the material designated as essential, the typographical cueing facilitated the learning of the essential material but did so at the expense of the unessential, or enrichment material. Hence, typographical cueing, although not inherently ineffective, does appear to be limited in its beneficial effects. However, this limitation is not as severe as it may first appear, for presumably, enrichment material is incorporated in a lesson, not as a body of information to be learned as such, but as an aid or inducement to the reader in learning the essential lesson content. For example, although the details of the attack of the Alamo do not appear to be worth committing to memory as such, these details did appear in the present lesson as part of an enriched context in which the essential historical facts were presented. This being the case, the fact that highlighting essential lesson content via typographical cueing decreases a reader's assimilation of the enrichment content should merely serve to caution the programer to exercise reasonable care in his judgment as to which lesson content is essential and is to be highlighted, and which content is merely enrichment material.

The present results, like those of the original study demonstrate the marked superiority of the programed or quizzed text over the conventional or non-quizzed text. The programed text, as defined operationally by the experimental procedures used here, is not the same as conventional self-instructional programs, in which, incidentally, self-test items have typically failed to facilitate learning beyond that produced by reading (Alter & Silverman, 1963). First, in contrast to conventional programs in which the testing of an item of information occurs concurrently with its instruction, the self-evaluational test items in the programed text used here are delayed test items which evaluate the retention of information the reader has been exposed to earlier in the course of the lesson. Secondly, self-evaluational test items are not followed by formal confirmation or correction of response. Thirdly, if the reader cannot properly respond, he is instructed to reread the appropriate section to find the answer, the response item being, therefore, primarily self-evaluational. (In many ways the programed text used here more closely resembles, both in format and effectiveness, Pressey's type of "adjunct program" -- i.e., teaching by testing -- (1960) than Skinner's (1958) type of linear program or Crowder's (1960) type of intrinsic program.)

The self-test items of the programed version of the text, like typographical cueing distinguishing essential from enrichment content, increase the learning of the essential material of the lesson; but, unlike typographical cueing, the self-test items do not inhibit the learning of the enrichment material. Adding self-test items to a text also appears to have a much greater absolute effect upon the amount learned than does the addition of typographical cueing. However, self-test items increase reading time whereas typographical cueing does not. In practical situations, therefore, the decision as to the use of self-test items requires a trade-off decision between learning level and study time.

Since no interaction was observed between type of Text and typographical Format (i.e., T x F) the effects of typographical cueing and self-evaluational quizzing can be assumed to be independent and additive.

That is, the effectiveness of either technique does not depend upon the other. Each can be used effectively alone, or they may be used together to obtain the beneficial effects of both.

Summary

As a follow-up to an original study reported by the senior author, the present study assessed the instructional effectiveness of typographical cueing in both conventional and programed (i.e., quizzed) texts as a function of reading ability, reading instructions and cueing complexity.

A total of 118 eighth-grade students were divided into 8 experimental groups closely matched for reading ability. Each group read a lesson on the history of Texas and was tested twice on that topic, once a week before the lesson (pretest) and again the day after the lesson (posttest). The pretests were administered so that gain scores could be used in the analysis of results.

Each group read a different form of the lesson. Four groups read programed versions of the lesson and four read conventional, non-quizzed versions. From each of these sets of four, one group read lesson booklets incorporating complex typographical cueing, another read booklets incorporating simple typographical cueing, and a third group (control) read booklets without typographical cueing. The fourth group from each set read lesson booklets incorporating complex typographical cueing, but unlike the other cued booklets, these booklets did not include a detailed explanation of the purpose or proper use of the typographical cueing. Gain scores for these groups were compared in several ways by analysis of variance.

The major findings were as follows: Eighth-grade students, like their less able fifth-grade juniors (as observed in the original study), do not benefit from complex typographical cueing -- distinguishing five content categories -- either with or without the "assistance" of detailed reading instructions. However, when only two content categories are distinguished -- essential vs. enrichment -- and eighth-grade students are instructed to read everything and learn the important material, typographical cueing facilitates the learning of the essential material but does so at the expense of the unessential or enrichment material.

The programed, or quizzed versions of the text were much more effective than the conventional non-quizzed versions of the text. Further, the self-evaluational test items of the programed texts facilitated the learning of the essential, core content without hampering the learning of the enrichment content.

Finally, the effects of typographical cueing and self-evaluation quizzing are independent and additive. That is, they may be used effectively alone. Or, they may be used together to obtain the beneficial effects of both. Adding self-evaluational quizzing requires added study time, while adding simple typographical cueing does not.

References

Alter, Milicent and Silverman, R. E. The response in programed instruction. J. Programed Instruction, 1963, 1, 55-78.

Crowder, Norman A. Automatic tutoring by intrinsic programming. In A. A. Lumsdaine and R. Glaser (Eds.) Teaching machines and programed learning. Washington, D. C.: Nat. Educ. Assn., 1960. Pp. 286-298.

Hershberger, W. A. Learning via programed reading. American Institute for Research. Contract No. Nonr-3077(00), Technical Report No. 5, July 1963a.

Hershberger, W. A. Cue-versus response in programed reading. American Institute for Research, Contract No. Nonr-3077(00), Technical Report No. 6, July, 1963b.

Klare, G. R., Mabrey, J. E., and Gustafson, L. M. The relationship of verbal communication variables to immediate and delayed retention and to acceptability of technical training materials. Air Force Personnel and Training Research Center, Air Research and Development Command, Chanute Air Force Base, Illinois, 1954.

Lindquist, E. F. Design and analysis of experiments in psychology and education. New York: Houghton Mifflin, 1953.

Pressey, S. L. Development and appraisal of devices providing immediate automatic scoring of objective tests and concomitant self-instruction. In A. A. Lumsdaine and R. Glaser (Eds.) Teaching machines and programmed learning. Washington, D. C.: Nat. Educ. Assn., 1960. Pp. 69-88.

Skinner, B. F. Teaching Machines. Science, 1958, 128, 969-977.

Todd, L. P. and Cooper, K. S. New ways in the new world. Sacramento, California: State Department of Education, 1956.

APPENDIX

Reading instructions for each of the eight experimental groups listed in Table 2. The code in upper right-hand corner of a page of instructions identifies the group with which it was used.

INSTRUCTIONS

Please read this booklet rapidly but carefully so that you understand the material and can remember the more important parts. Do not try to remember everything you read. Be selective. Learn the important material.

There are questions scattered throughout the booklet quizzing you about the important material. As you read try to anticipate or guess what information you will be questioned about, and try to be prepared to answer the questions when you come upon them. However, in any case be certain that you answer each question and answer it correctly. If you are uncertain, turn back the pages and reread the necessary sections. Learn the answers, do not merely write them down.

This booklet is not a test; it is a lesson. The questions in the booklet are not there to puzzle or "stump" you; they are there to help you. So, use the questions to help yourself learn the important material. If you do not know the answer to a question, you at least know one thing. You know that the information you are being questioned about is an important part of the lesson and that it is wise to go back and learn the answer. (You will be tested later to see how much you have learned.)

Please wait for the teacher to tell you to begin reading the booklet.

INSTRUCTIONS

Please read this booklet rapidly but carefully so that you understand the material and can remember the more important parts. The more important parts have been printed in red ink.

Read rapidly and lightly over the material printed in black for it is not very important. Read carefully over the material printed in red for it is important, and you are expected to learn and remember the important material.

It may be necessary for you to read the important material several times before you are able to remember it. To preview or review the important material, simply read the material printed in red. You may do this as much and as often as you like.

There are questions scattered throughout the booklet quizzing you about the important material. Try to be prepared to answer the questions when you come upon them. However, in any case be certain that you answer each question and answer it correctly. If you are uncertain, turn back the pages and reread the necessary sections (in red.) Learn the answers; do not merely write them down.

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Before reading on, review these instructions by reading the passages printed in red.

Please wait for the teacher to tell you to begin reading the booklet.

INSTRUCTIONS

Please read this booklet rapidly but carefully so that you understand the material and can remember the more important parts. The more important parts have been underlined or printed in red ink.

Read rapidly and lightly over the material printed in black for it is not very important. Read carefully over the material highlighted in red, for it is important and you are expected to learn and remember the important material. Four types of important material have been highlighted in four (4) different ways; each should be read differently. The four types of material and highlighting are listed below with suggested reading techniques for each.

Type of material	Type of highlighting	How to "read"
New and unfamiliar key words	CAPITAL RED LETTERS	Memorize verbatim; learn to spell
Familiar key words, key statements, dates etc.	small red letters underlined	Study carefully; be able to recall exactly
Basic important statements	small red letters	Read carefully but don't dally
Important examples	small black letters underlined	Read swiftly; it should be easy to remember

It may be necessary for you to read some of the important material several times before you are able to remember it. To preview or review any particular type of important material, simply read the material highlighted in the appropriate fashion. You may do this as much and as often as you like.

There are questions scattered throughout the booklet quizzing you about the important material. Try to be prepared to answer the questions when you come upon them. However, in any case, be certain that you answer each question and

answer it correctly. If you are uncertain, turn back the pages and reread the necessary sections (highlighted in red.) Learn the answers; do not merely write them down.

This booklet is not a test; it is a lesson. The questions in the booklet are not there to puzzle or "stump" you; they are there to help you. So, use the questions to help yourself learn the important material. If you do not know the answer to a question, you at least know one thing. You know that the information you are being questioned about is an important part of the lesson and that it is wise to go back and learn the answer. (You will be tested later to see how much you have learned.)

Before reading on, review these instructions by reading the passages printed in red.

Please wait for the teacher to tell you to begin reading the booklet.

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Whenever you wish, you may turn back the pages and reread what you have already read. You may do this as often as you like.

Please wait for the teacher to tell you to begin reading the booklet.

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It may be necessary for you to read the important material several times before you are able to remember it. To preview or review the important material simply read the material printed in red. You may do this as much and as often as you like.

Before reading on, review these instructions by reading the passages printed in red.

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Type of material	Type of highlighting	How to "read"
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